REPORT NO. 82-2-14
ALEXANDRIA FIELD OFFICE

3430
JULY 1982

BIOLOGICAL EVALUATION OF SOUTHERN PINE BEETLE ON THE YELLOWPINE RANGER DISTRICT, SABINE NATIONAL FOREST

Texas

by

Wesley A. Nettleton, Neil A. Overgaard[1/], and David B. Drummond[2/]

Abstract

A biological evaluation for southern pine beetle (SPB) was conducted on 78,261 acres of the Yellowpine Ranger District, Sabine National Forest in Texas. During July 1982 the Yellowpine Ranger District had an estimated 30 active spots, 21,519 acres of susceptible host type, and 1.4 SPB spots/1000 acres of susceptible host type in the outbreak area. Forest Pest Management recommends that a SPB suppression project be initiated on the Yellowpine Ranger District.

INTRODUCTION

A biological evaluation was conducted on the Yellowpine Ranger District (RD) of the Sabine National Forest to determine the status of southern pine beetle (Dendroctonus frontalis Zimm.) populations. Entomologists from State & Private Forestry, Forest Pest Management (FPM), Alexandria, LA, Field Office conducted the evaluation on July 12-14, 1982.

Southern pine beetle (SPB) infestations have been occurring on the National Forests in Texas since the early 1960's. Since that time beetle populations have fluctuated between endemic and epidemic levels on various districts. The last major peak in SPB activity on the Yellowpine RD took place in the summer of 1976 (Overgaard 1976) when there were 39 multiple tree spots and 0.54 spots/M acres of host type. Historically, the Sabine National Forest has not suffered as severe losses as other National Forests in Texas.

1/ Entomologists, USDA Forest Service, Southeastern Area, State & Private Forestry, Forest Pest Management, Pineville, LA.

2/ Field Office Representative, USDA Forest Service, Southeastern Area, State & Private Forestry, Forest Pest Management, Pineville, LA.

METHOD OF EVALUATION AND ANALYSIS OF SPB INFESTATION

Aerial Survey and Ground Checks

Standard aerial sketch map procedures were used for this evaluation, except survey coverage was 100 percent. The aerial survey was conducted by district personnel on July 8, 1982, and spots of red and/or fading trees were recorded and plotted on Forest Service Class A maps. Ten spots were randomly selected for ground checking.

Numbers of vacated and infested trees, basal area, age, height, percentage of the stand in sawtimber, and landform were recorded. This information was used to run the benefit/cost analysis and to hazard rate the stands.

Hazard Rating

All the SPB infested stands were hazard rated at the time of ground checking. This is part of FPM's effort to validate SPB hazard rating systems whenever the opportunity exists. The system used was developed on the Kisatchie National Forest by Dr. Peter Lorio of the Southern Forest Experiment Station. It is designed for use by the National Forests in Region 8 and utilizes field data collected by the prescriptionist during the field procedure (FSH 2409.21d R8 Kisatchie National Forest Supplement No. 7). Due to the similar nature of the forest conditions between central Louisiana and east Texas, we feel that this hazard rating system should accurately reflect host/site/stand characteristics associated with SPB attack on the Yellowpine RD (Lorio and Sommers 1981).

Suppression Project Criteria

Decisions to initiate a SPB suppression project were based on the following criteria:

- Number of SPB spots per 1,000 acres of susceptible host type

  This figure provides an indication of current levels of SPB activity. Historically, 1 multiple tree spot/1,000 acres of susceptible host type has been considered the lower threshold of a SPB epidemic. However, 1 or more spots/1,000 acres of susceptible host type do not always require that a SPB suppression project be undertaken. This is the case when the majority of the spots are small, involving minimal timber losses, and individual spots are likely to go inactive. To determine the number of acres of susceptible host type the Continuous Inventory of Stand Conditions (CISC) data for the Sabine National Forest was accessed and number of acres of shortleaf-oak, loblolly-hardwood, slash, longleaf, loblolly, shortleaf, and bottomland hardwood-yellow pine were determined (forest type codes 12, 13, 21, 22, 31, 32, and 46). Regeneration, seedling-sapling and sparse stand, acreage was subtracted from the total as these areas have little chance of sustaining large losses to SPB.

- Green tree:red tree ratio

  This ratio, based on the number of green infested trees to the number of red and fading infested trees, provides an indication of how rapidly a SPB spot is expanding at the time of ground check.

- Additional timber loss in each spot for the 30 day period following ground check

  A formula developed by Billings and Hynum (1980) was used to predict additional timber loss during the 30 day period following ground checks. This formula uses total basal area (TBA), and number of trees infested at the initial visit (IAT) to predict additional trees killed in a 30 day period (ATK). The number of spots showing additional timber loss and the size of this loss are used to provide an indication of whether SPB losses will continue. Even if a large number of SPB spots occur on a district they are relatively unimportant if additional timber losses are small.

- Volume of timber currently infested and economic evaluation

  The volume of timber currently infested is calculated from the ground checked SPB spots. The currently infested volume is used in the Southern Pine Beetle Economic Evaluation Program (SPBEEP) to develop the economic benefit cost ratio, internal rate of return, targets for timber to be removed, and the volume of timber protected by control efforts. As the volume of timber currently infested with SPB increases, the economic benefits from a SPB suppression project also increase.

- Entomological judgment

  Professional experience and field observations from the ground checked spots are used to interpret and supplement the technical data to reach a final decision.

RESULTS AND DISCUSSION

A total of 30 multiple tree SPB spots were recorded during the aerial survey. Ground checks by district personnel determined that all the spots were actively infested by SPB. Ten spots were ground checked by FPM during the evaluation and the data are summarized in table 1. The ground checked spots ranged in size from 9-473 trees and the ratio of green infested trees:red infested trees was 2.2:1. Most of the spots were rapidly expanding and contained many trees with fresh attacks.

Figure 1 shows the area of heaviest SPB activity. There is a total of 57,214 acres of susceptible host type for the entire Yellowpine RD which gives a mean 0.5 SPB spots/1,000 acres of susceptible host type. However,

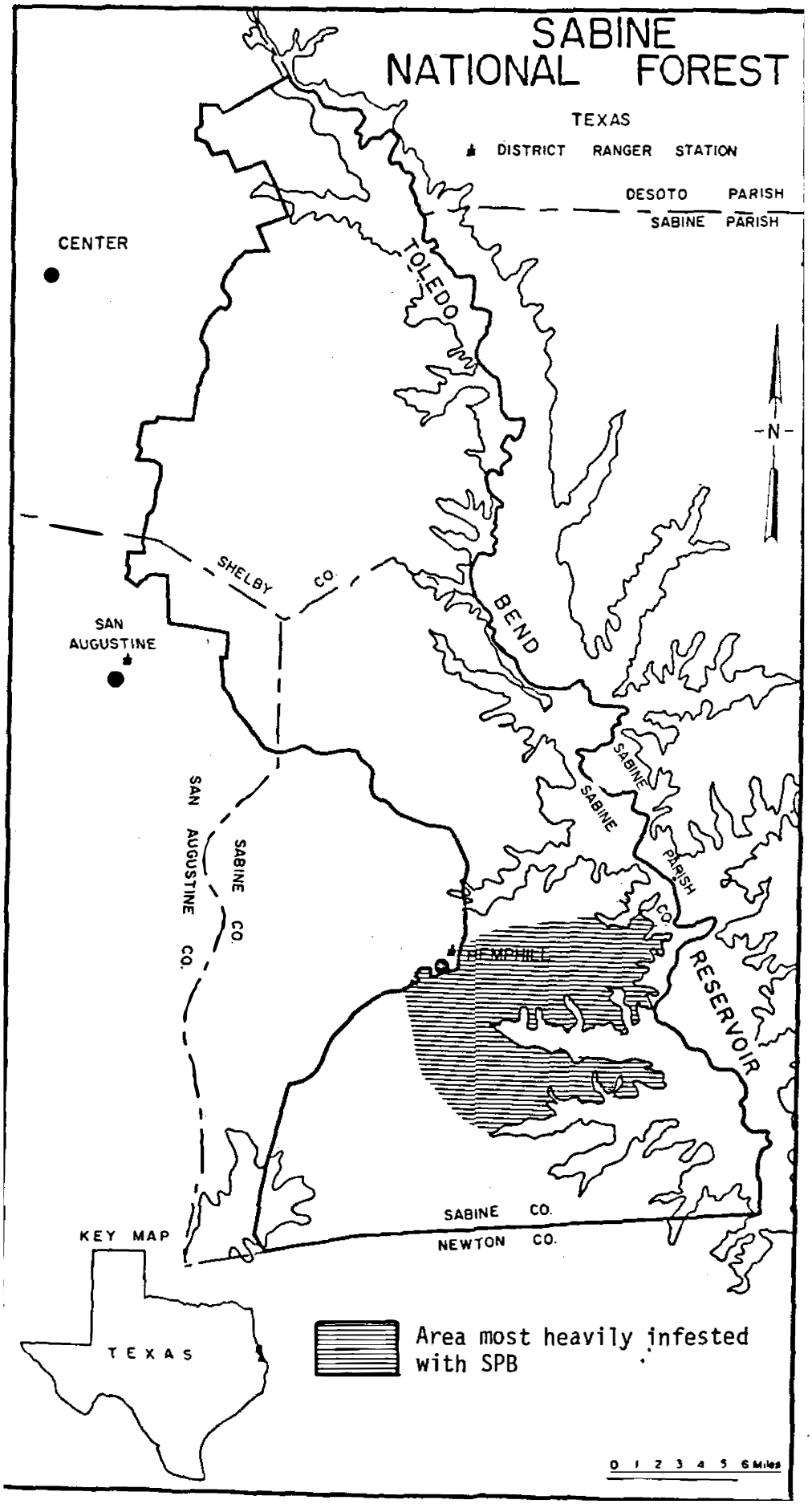
Table 1. Summary of ground check data for the Yellowpine Ranger District, Sabine National Forest, July 1982.

Spot No.	Total No. Trees	No. Infested Trees			No. Vacated Trees				% Infested	Green:Red Ratio[a/]	Additional Spot Growth Loss[b/]	Age	Total Basal Area
		Total	Green	Red	Total	Green	Red	Black					
1	461	297	180	117	164	2	138	24	64	1.5:1	227	65	130
2	65	56	49	7	9	1	8	0	86	7.0:1	61	70	200
3	41	21	12	9	20	0	19	1	51	1.3:1	10	55	130
4	156	106	86	20	50	1	42	7	67	4.3:1	77	51	130
5	60	13	6	7	47	0	31	16	21	0.9:1	1	35	100
6	473	265	183	82	208	3	179	26	56	2.2:1	234	60	150
7	103	55	41	14	48	2	40	6	53	2.9:1	37	40	130
8	42	15	11	4	27	0	22	5	35	2.7:1	4	80	120
9	9	5	3	2	4	0	3	1	55	1.5:1	0	90	140
10	31	24	19	5	7	0	5	2	77	3.8:1	15	62	150
TOTAL	1,441	857	590	267	584	9	487	88	-	-	666	-	-
MEAN	144	85	59	26	59	1	49	9	59	2.2:1	67	61	138

[a/] Based on infested trees only.

[b/] Additional number of trees lost over 30 days during summer months. Based on formula ATK = [(0.000202 IAT x TBA) - 0.2211] x 30 (Billings and Hynum 1980).

Figure 1. Location of heaviest southern pine beetle activity on the Yellowpine Ranger District



if you consider the acres within the compartments in the area of heaviest infestation, the acres of susceptible host type is reduced to 21,519 and the ratio increases to 1.4 SPB spots/1,000 acres of susceptible host type. This is more indicative of the epidemic conditions that were encountered in the outbreak area.

Trend

Of the 10 spots ground checked 7 were predicted to have significant additional timber loss during the 30 day period following ground checking (table 1). The range in predicted spot growth was from 0 to 234 trees with a mean of 67 trees.

Economic Analysis

The estimated volume of trees currently infested is 1,183 MBF. If a SPB suppression project were undertaken it is estimated that 1,065 MBF would be removed and 733 MBF of timber would be protected. For detailed information on the economic benefits with and without a project refer to Appendix I.

Hazard Rating

All of the 10 infestations rated as high or medium risk to SPB attack. Lorio found on the Kisatchie National Forest that the majority of large SPB infestations occurred in loblolly pine stands that were immature or mature sawtimber, well stocked, and on good sites (90 or better site index). This holds true for the ground checked spots on the Yellowpine RD as table 2 demonstrates.

RECOMMENDATIONS

Based on the number of SPB spots/1000 acres of susceptible host type in the outbreak area, the ratio of green infested to red infested trees, predictions for additional losses and the economic analysis, FPM recommends a suppression project for the Yellowpine RD. We recommend using primarily the salvage and cut-and-leave techniques for spot suppression. A detailed description of these and other control alternatives is addressed in Appendix II.

Due to the large number of spots needing treatment we also recommend using the Southern Pine Beetle Fact Sheet No. 3 (Anonymous 1979) or Texas Forest Service Circular 249 (Billings and Hynum 1980) to establish spot priorities for control. In addition, a hazard rating program using CISC information (Lorio and Sommers 1981) has been developed. This program prints a listing of high and medium risk stands. Those spots in high and medium hazard stands which are likely to increase in size should receive priority for removal. We have sent a copy of this listing to the Yellowpine RD for their use.

Table 2. SPB hazard rating summary for infestation locations, Yellowpine Ranger District, Sabine National Forest, July 1982.

Spot No.	Total Basal Area	Pine Basal Area	Total Tree Height	Site Index	Diameter (in.)	Age	Predominant Pine Species	SPB Hazard Rating[1/]
1	130	120	90	80	14	65	Loblolly	High
2	200	160	120	110	18	70	Loblolly	High
3	130	110	85	90	14	55	Loblolly	High
4	130	80	95	100	15	51	Loblolly	Medium
5	100	100	80	90	12	35	Loblolly	High
6	150	140	85	80	13	60	Loblolly	High
7	130	120	80	90	16	40	Loblolly	High
8	120	90	100	90	18	80	Shortleaf	Medium
9	140	90	95	90	17	90	Loblolly	Medium
10	150	110	90	90	15	62	Loblolly	High
MEAN	138	112	92	91	15	61	-	-

1/ Based on FSH 2409.21d R8 Kisatchie National Forest Supplement No. 7.

If the market for timber becomes a problem and mill quotas are established, we recommend cutting only the buffer strip and infested trees, leaving vacated trees standing. This procedure will control SPB spots and reduce the amount of timber going to markets. The remaining vacated trees will provide some value as wildlife snags.

APPENDIX I

Table 3. Southern pine beetle economic evaluation for the Yellowpine RD at 4% discount rate.

WITHOUT A PROJECT

AGE	HARV OBJ.	VOLUME LOST (MBF)	SPOT GROWTH RATE	VOLUME THREAT (MBF)	GROWTH RATE (%)	AGE AT HARV.	VOLUME AT HARVEST (MBF)	PRICE AT HARV.	VALUE AT HARVEST	PRESENT VALUE
40	S/I	24	1.41	33	1.7	45	37	$ 108	$ 3972	$ 3139
40	S/F	71	1.41	99	1.0	70	134	$ 108	$ 14479	$ 4292
55	S/F	190	2.51	475	.6	70	521	$ 108	$ 56226	$ 30019
75	S/F	189	1.95	369	.3	75	370	$ 108	$ 39986	$ 38448
TOTAL		473		977			1062		$ 114662	$ 75899

VALUE OF THE VOLUME NOT SALVAGED (LOST) $ 25080

TOTAL VALUE LOST $ 100978

WITH A PROJECT

AGE	HARV OBJ.	VOLUME LOST (MBF)	SPOT GROWTH RATE	VOLUME THREAT (MBF)	GROWTH RATE (%)	AGE AT HARV.	VOLUME AT HARVEST (MBF)	PRICE AT HARV.	VALUE AT HARVEST	PRESENT VALUE
40	S/I	6	1.41	8	1.7	45	9	$ 108	$ 993	$ 785
40	S/F	18	1.41	25	1.0	70	34	$ 108	$ 3620	$ 1073
55	S/F	47	2.51	119	.6	70	130	$ 108	$ 14056	$ 7505
75	S/F	47	1.95	92	.3	75	93	$ 108	$ 9996	$ 9612
TOTAL		118		244			265		$ 28666	$ 18975

VALUE OF THE VOLUME NOT SALVAGED (LOST) $ 6270

TOTAL VALUE LOST $ 25245

PROJECT BENEFITS:	75734
TOTAL PROJECT COST:	4954
NET PRESENT VALUE:	70780
BENEFIT COST RATIO:	15.29
INTERNAL RATE OF RETURN:	> 400%
COMPOSITE RATE OF RETURN:	13.56%
TARGETS	
VOLUME REMOVED:	1065
VOLUME PROTECTED:	733

Table 4. Southern pine beetle economic evaluation for the Yellowpine Ranger District at 7.12% discount rate.

WITHOUT A PROJECT

AGE	HARV OBJ.	VOLUME LOST (MBF)	SPOT GROWTH RATE	VOLUME THREAT (MBF)	GROWTH RATE (%)	AGE AT HARV.	VOLUME AT HARVEST (MBF)	PRICE AT HARV.	VALUE AT HARVEST	PRESENT VALUE
40	S/I	24	1.41	33	1.7	45	37	$ 108	$ 3972	$ 2629
40	S/F	71	1.41	99	1.0	70	134	$ 108	$ 14479	$ 1717
55	S/F	190	2.51	475	.6	70	521	$ 108	$ 56226	$ 18707
75	S/F	189	1.95	369	.3	75	370	$ 108	$ 39986	$ 37328
TOTAL		473		977			1062		$ 114662	$ 60381

VALUE OF THE VOLUME NOT SALVAGED (LOST) $ 25080

TOTAL VALUE LOST $ 85461

WITH A PROJECT

AGE	HARV OBJ.	VOLUME LOST (MBF)	SPOT GROWTH RATE	VOLUME THREAT (MBF)	GROWTH RATE (%)	AGE AT HARV.	VOLUME AT HARVEST (MBF)	PRICE AT HARV.	VALUE AT HARVEST	PRESENT VALUE
40	S/I	6	1.41	8	1.7	45	9	$ 108	$ 993	$ 657
40	S/F	18	1.41	25	1.0	70	34	$ 108	$ 3620	$ 429
55	S/F	47	2.51	119	.6	70	130	$ 108	$ 14056	$ 4677
75	S/F	47	1.95	92	.3	75	93	$ 108	$ 9996	$ 9332
TOTAL		118		244			265		$ 28666	$ 15095

VALUE OF THE VOLUME NOT SALVAGED (LOST) $ 6270

TOTAL VALUE LOST $ 21365

PROJECT BENEFITS:	64095
TOTAL PROJECT COST:	3716
NET PRESENT VALUE:	60379
BENEFIT COST RATIO:	17.25
INTERNAL RATE OF RETURN:	> 400%
COMPOSITE RATE OF RETURN:	17.43%
TARGETS	
VOLUME REMOVED:	1065
VOLUME PROTECTED:	733

Appendix II

ALTERNATIVES FOR SOUTHERN PINE BEETLE CONTROL

Four alternatives are recommended for southern pine beetle control. The following discussion briefly outlines these alternatives (Swain & Remion 1980). For a more detailed description on conducting control procedures in a southern pine beetle suppression project refer to the Project Control Plan.

Alternative 1. Remove trees through salvage.

Salvage is the method most often used for stopping the growth of existing spots. This strategy involves removing a buffer strip of noninfested trees, all green infested and red infested trees, and if desired, the trees already killed by the beetles. Costs associated with removing uninfested trees are not charged to specifically designated SPB Project Control Funds since removing uninfested material is not needed for successful control even though it may be operationally desirable. The buffer strip should surround the recently attacked trees. It should be 40 to 70 feet wide for most active spots, while a 100-ft strip (and occasionally larger) may be needed for large, rapidly expanding spots. As a rule, the width of the buffer should not exceed the average height of the trees in the spot. The SPB spot should be carefully surveyed and all trees to be removed should be marked.

To implement this alternative the buffer strip should be cut first. All infested trees should then be cut. Vacated trees are cut last and are removed only for utilization purposes. All trees should be felled toward the center of the spot. The reason for this is to keep infested trees as far away from noninfested trees as possible. This reduces the chance of beetles killing additional trees.

Alternative 2. Piling and burning.

Unmerchantable or inaccessible southern pine beetle infestations can be suppressed by cutting, piling, and thoroughly charring the bark of infested trees. The entire bark surface must be thoroughly charred to insure effective control. The order of priority for cutting, piling, and burning infested trees, particularly in large spots, is the same for Alternative 1. Cutting a buffer strip is not recommended. To reduce the possibility of "breakouts", every effort should be made to locate and treat all green infested trees during the piling and burning operation.

Alternative 3. Cut-and-leave infested trees.

This is accomplished by felling a buffer strip and all infested trees toward the center of the spot. The purpose is to stop spot growth. Use of this method causes beetles to disperse at a time of year when this behavior is unnatural. This results in a reduction of mass attacked trees and spot growth ceases. Cut-and-leave should only be used in the summer (May 1 -

September 30), since these are the only months beetles are not dispersing. It should only be used on small spots, normally 50 infested trees or less.

Alternative 4. Chemically treat infested trees.

In this method, infested trees are felled toward the center of the spot, cut into workable lengths, and sprayed with lindane or Dursban® 4E. The purpose of this method is to kill the beetle population. To be effective, all bark surfaces must be sprayed. This involves turning the logs which becomes more difficult as tree size increases.

Forest Pest Management, Alexandria Field Office, Pineville, LA, should be contacted prior to the extensive use of chemical control for an update on latest restrictions or application procedures.

United States Department of Agriculture
Forest Service

FOREST INSECT AND DISEASE MANAGEMENT

Technology Update

Southeastern Area, State and Private Forestry, 1720 Peachtree Road, N.W., Atlanta Ga. 30309

Southern Pine Beetle Fact Sheet
Number 3

SETTING CONTROL PRIORITIES

FOR THE SOUTHERN PINE BEETLE*

All southern pine beetle spots (groups of infested trees) do not have the same control priority. The following guidelines should help you set priorities for controlling individual spots.

A. Classify the infested trees according to the stage of attack shown below.

Symptom	Stage 1 Fresh attacks	Stage 2 Developing broods	Stage 3 Vacated trees
Foliage	Green	Green, trees with larvae; fade to yellow before new generation.	Red, needles falling.
Pitch tubes	Soft white, light pink,	White, hardened.	Hard, yellow, crumbles easily.
Checkered beetles	Adults crawl on the bark.	Larvae in SPB galleries; pink or red; 1/2 inch long.	Larvae and pupae are purple; occur in pockets in the outer bark.
Bark	Tight, hard to remove.	Loose, peels easily.	Very loose, easily removed.
Color of wood surface	White, except close to new adult galleries.	Light brown with blue or black sections.	Dark brown to black, may have sawyer galleries.
Exit holes	----	May appear where parent beetles left the tree.	Numerous
Ambrosia beetle dust	---- ----	White, begins to appear around the base of trees.	Abundant at the base of trees.

*Compiled from a handbook of the Texas Forest Service. It will be published this fall by the USDA's Expanded Southern Pine Beetle Research and Applications Program.

B. Collect spot expansion data:

1. Walk completely around the spot and look for stage 1 trees, which indicate the area of most recent beetle activity. Areas with stage 1 pines are called "Active heads." Check to see if the spot is expanding in more than one direction. Large spots can have more than one active head.

2. Determine the number of stage 1 and 2 trees. For large spots that have more than 50 trees, it is not necessary to examine each tree. Just walk the boundaries and estimate the number of these trees in the spot.

3. From a location about 20 feet (6 m) in front of the active head(s), determine the pine basal area (a measure of stand density) in square feet per acre. A 10-factor prism is useful for this purpose.

4. Note whether most trees in the spot are pulpwood (less than 9 inches in diameter) (23 cm) or sawtimber size (more than 9 inches in diameter).

5. If only stage 3 trees are present, control is not necessary.
6. Determine the control priority for the spot, using the guide on the next page (item C).

C. Guide to southern pine beetle control priorities (May through October):

Key to spot growth	Your spot's classification	risk-rating points
A. Stage 1 trees	absent	0
	present	30
B. Stage 1 and 2 trees	1 to 10	0
	11 to 20	10
	21 to 50	20
	more than 50	40
C. Pine basal area (ft^2/a) or stand density at active head or heads	less than 80 (low density)	0
	80 to 120 (medium density)	10
	more than 120 (high density)	20
D. Stand class by average d.b.h. (in inches)	pulpwood (9 inches or less)	0
	sawtimber (more than 9 inches)	10

	Buffer strip width (feet)
If total is: 70 to 100.....control priority is: High	40 to 100
If total is: 40 to 60.....control priority is: Medium	10 to 40
If total is: 0 to 30.....control priority is: Low	10 to 40

Southern Pine Beetle

Guide for Predicting Timber Losses from Expanding Spots in East Texas

by

R. F. Billings and B. G. Hynum

Circular 249 **March 1980**

TEXAS FOREST SERVICE
A Part of
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Many southern pine beetle infestations (SPB spots) enlarge during warm months if no direct control is applied. Other spots are abandoned by emerging beetles soon after detection with little or no additional loss of trees. The extent of timber losses from spot expansion will depend on the initial size of the infestation and the density (basal area) of the stand. The following steps describe how to predict tree and dollar losses from spot spread over a 30 day period during summer months. This estimate is useful for making better control decisions.

1. Examine the spot to determine if trees with fresh SPB attacks (stage 1) are present. See USDA Agricultural Handbook 558 for details. If there are no fresh attacks, no additional spot spread is likely to occur and the spot will probably be inactive within 30 days.

2. If freshly-attacked trees are present, count or estimate the total number of active trees in the spot. Active trees include trees with fresh attacks (stage 1) as well as those with SPB larvae, pupae or new adults (stage 2).

3. Estimate the stand basal area (in ft^2/acre) at the active head(s) of the spot, using a 10 factor prism. (Stand basal area = basal area of pines + hardwoods.)

4. From Table 1 (on reverse side) determine the additional tree losses to be expected after 30 days. *This estimate does not include the trees already dead or currently infested with beetles.*

5. To estimate the dollar loss to be expected from spot expansion over the next 30 days, use the following formula:

Expected dollar loss = A x B x C

where:

A = additional trees killed from Table 1.
B = average volume per tree.
C = stumpage price per unit volume.

6. For a given spot, the value in Table 1 for "trees remaining active" is an estimate of the number of active trees to be expected at day 30. This value, when compared to number of active trees at day 0, indicates whether the level of beetle activity in the spot is likely to increase or decrease if no control is applied.

Example Of How To Figure Dollar Losses

Question: What are the tree and dollar losses to be expected after 30 days from a spot of 75 active trees in a uniform sawtimber stand of 150 ft^2/acre basal area if average volume/tree = 100 bd. ft and stumpage price = $250/MBF?

Answer: From Table 1, additional trees killed after 30 days = 62.

Additional dollar loss = (62 trees) x (100 bd. ft/tree) x ($0.25/bd. ft) = *$1550.*

In other words, if this spot is not controlled, the landowner can expect to loose 62 more trees in the next 30 days, valued at $1550. This loss is in addition to trees already infested or dead.

TABLE 1

Additional Timber Losses To Be Expected From Spot Growth Over 30 Days During Summer in East Texas[1]

Number of Active Trees At Day 0[2]		Total Stand Basal Area (ft²/acre)			
		20-60	70-110	120-160	170-210
		Predicted Value at Day 30			
5	Additional trees killed[3]	0	0	0	0
	Trees remaining active[4]	≤ 1	≤ 1	≤ 1	≤ 1
10	Additional trees killed	0	0	2	5
	Trees remaining active	≤ 2	≤ 2	4	7
20	Additional trees killed	0	5	12	18
	Trees remaining active	≤ 4	9	16	22
30	Additional trees killed	2	12	21	30
	Trees remaining active	8	18	27	36
50	Additional trees killed	9	24	39	54
	Trees remaining active	18	33	48	63
75	Additional trees killed	16	39	62	84
	Trees remaining active	30	53	76	98
100	Additional trees killed	24	54	84	115
	Trees remaining active	43	73	103	134

[1]To be used for evaluating spots in East Texas during months of June-October only.

[2]Number of stage 1 + stage 2 trees present when spot growth prediction is made.

[3]Predictions for "additional trees killed" derived from Texas Forest Service spot growth model (based on 1975 data):

$$ATK = [(0.000202\ IAT \times TBA) - 0.2211] \times 30$$

where ATK = number of additional trees killed by day 30
IAT = number of active trees at day 0
TBA = total basal area in ft²/acre

[4]Predictions for "trees remaining active" (TRA) based on SPB developmental rate of 37 days and formula:

$$TRA = ATK + \frac{7}{37}(IAT)$$

PRECAUTIONARY STATEMENT

Pesticides used improperly can be injurious to man, animals, and plants. Follow the directions and heed all precautions on the labels.

Store pesticides in their original containers under lock and key out of reach of children and animals, and away from food and feed.

Apply pesticides so that they do not endanger humans, livestock, crops, beneficial insects, fish and wildlife. Do not apply pesticides when there is danger of drift, when honey bees or other pollinating insects are visiting plants, or in ways that may contaminate water or leave illegal residues.

Avoid prolonged inhalation of pesticide sprays or dusts; wear appropriate protective clothing.

If your hands become contaminated with a pesticide, wash them immediately with soap and water. In case a pesticide is swallowed or gets in the eyes, follow the first aid treatment given on the label and get prompt medical attention. If a pesticide is spilled on your skin or clothing, remove the clothing immediately and wash skin thoroughly. After handling or spraying pesticides, do not eat or drink until you have washed with soap and water.

Do not clean spray equipment or dump excess spray material near ponds, streams, or wells. Because it is difficult to remove all traces of herbicide from equipment, do not use the same equipment for insecticides or fungicides that you used for herbicides.

Dispose of empty pesticide containers promptly. Have them buried at a sanitary landfill dump, or crush and bury them in a level, isolated place.

NOTE: Some states have restrictions on the use of certain pesticides. Check your state and local regulations. Also, because registrations of pesticides are under constant review by the U.S. Environmental Protection Agency, consult your county agent, state extension specialist or FPM to be sure it is still registered for the intended use. For further information or assistance, contact Forest Pest Management, Alexandria Field Office, Pineville, La., 71360, (Telephone: FTS 497-7280, or Commercial 318/473-7280).

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